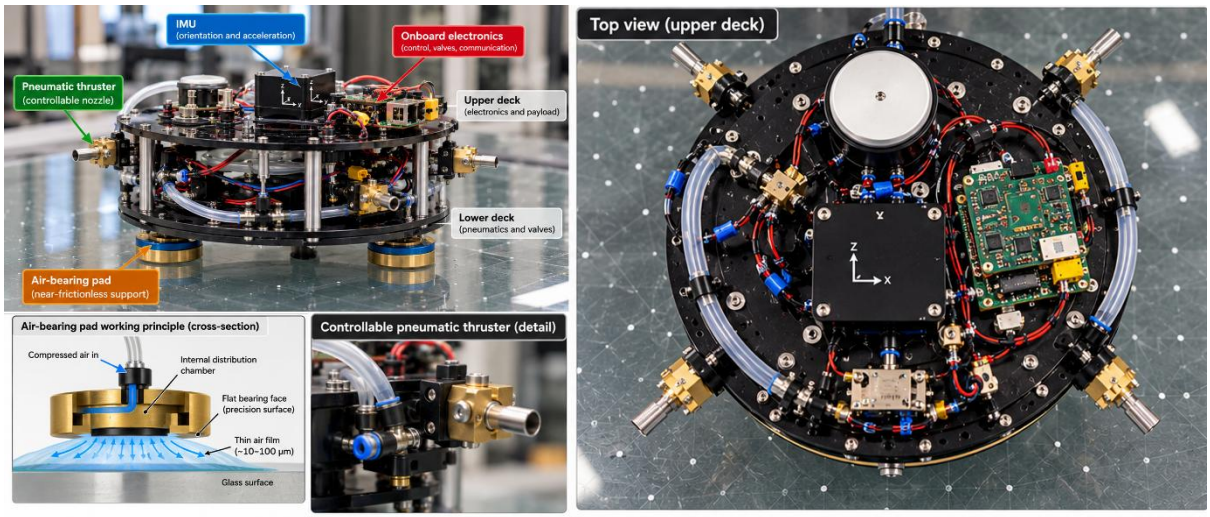
Student project: Development of an Air-Bearing Platform for Formation-Flying Experiments



The project aims to design and construct a modular spacecraft simulator for experimental investigation of formation-flying technologies using the existing Space Maneuvering and Docking (SMD) Facility at JMU Würzburg. The facility provides a near-frictionless planar environment using air-bearing technology and therefore enables representative laboratory experiments involving spacecraft translational and rotational motion.

The student will develop a compact floating platform integrating an air-bearing system, pneumatic actuation for planar translation and rotation, an IMU, and suitable onboard electronics for sensing and control. The platform should be modular and provide mechanical and electrical interfaces for the integration of additional experimental payloads and future formation-flying experiments.

Tasks

1. **State of the art:** Investigate existing air-bearing spacecraft simulators, including different air-bearing pad technologies, external and onboard compressed-air supply concepts, and pneumatic actuation systems.
2. **Concept development:** Define the system requirements and compare suitable concepts for the air bearings, pneumatic supply, actuation, and platform architecture.
3. **Mechanical design:** Design and manufacture the modular platform, considering mass distribution, stability, payload capacity, and future payload interfaces.
4. **Pneumatic system:** Select and integrate the air-bearing pads, air-supply system, valves, and nozzles required for floating and controlled planar motion.

5. **Electronics and sensing:** Integrate an IMU, control electronics, communication, and the required interfaces for the pneumatic actuators.
6. **Control:** Implement basic state estimation and closed-loop control of translational and rotational motion.
7. **Testing and validation:** Experimentally characterize the platform on the SMD facility and demonstrate controlled planar maneuvers relevant to formation flying.